Volume 4

PM PERSPECTIVES 2008

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NASA Project Management Challenge 2008

April 2008

From the PM Challenge Co-Chairs:

Along with our conference committee, we were thrilled to host PM Challenge 2008. Based on your feedback, the fifth annual NASA Project Management Conference was a great success, and continued to provide a forum to "Reach Higher" which challenges you, the NASA program and project management community, to better help execute the agency's strategic goals. PM Perspectives takes a look back at some of the highlights from the conference. The articles in this magazine were written by our student volunteers from Embry-Riddle Aeronautical University and Bethune-Cookman University, and offer insight into some of the important topics, lessons, and ideas presented at the conference.

Enjoy reading this issue of PM Perspectives, and pass it along to your colleagues. We look forward to seeing you for PM Challenge 2009 next year. All of the PM Challenge 2008 presentations can be found at: http://pmchallenge.gsfc.nasa.gov/presentations2008.htm

We would like to say a special thank you to Greg Wright, Phoebe Wescott and Jennifer Poston, for their creative efforts in making this edition of PM Perspectives possible.

Enjoy reading this issue of PM Perspectives, and pass it along to your colleagues.

Dorothy Tiffany,
Walt Majerowicz

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Managing Complex Projects

Panel Discussion
Written by Jacklyn Duff
Embry-Riddle Aeronautical University

Designing and creating equipment to function in the hardest and most dynamic conditions possible is a major feat. To add to that, the people involved in these projects have diverse backgrounds and are scattered across a nation. This qualifies most, if not all, space related endeavors as complex projects. How do we make projects of such magnitudes flow smoothly? Guidelines and pointers were given by a group of seasoned project managers at the NASA 2008 Project Management Challenge at the Managing Complex Projects workshop. The panel consisted of Richard Grammier, Project Manager for Juno Project at NASA Jet Propulsion Laboratory; Arthur Obenschain, Deputy Center Director at NASA Goddard Space Flight Center; Patrick Simpkins, Director of Engineering at NASA Kennedy Space Center; Terry Cooke-Davies, Founder and Executive Chairman of Human Systems International; and Ken Dolan, panel moderator with Capitol College.

The two resounding pieces of advice during the question and answer session were to chose appropriate leaders and have adequate communication. In response to a question about whether it is the technical or organizational aspect that complicates a project, Cooke-Davies' response was that the technical aspect of programs are manageable, however, the true hurdle is "behavioral and cultural complexity." Grammier added that one needs "frequent communication or projects will become even more complex." This communication system should be simple and not "over engineered," according to Cooke-Davies. He also stated that leaders need to be able to "manage on the fly. You can never predict what will come up."

Simpkins said that one of the qualities he looks for in a manager is the "experience in seeing around the corners." He exemplified this notion by explaining that the type of hypergolic fuel that is chosen will have a ripple effect large enough to even influence the determination of the type of rock to be used on the crawler way. This reiterated the fact that engineers have the capability and technical knowledge to determine, down to the most precise detail, even the perfect rocks. However, the true challenge is to get everyone the correct information.

This is why Cooke-Davies believes that promotions should be based on people skills instead of technical backgrounds. There are plenty of people with the technical knowledge and training, but there needs to be someone with the skills to properly ascertain and disperse information. Obenschain argues that if the leader does not have a sound enough technical background, misinformed and bad decisions will be made. His view of leadership is someone who has "vision, takes people places they don't want to go, and every person is better off for going on the journey with the leader." This statement alone seems to be the essence and the very foundation of the space program itself.

A goal of a leader and his or her team is to meet the requirements set forth. Grammier explained that language can be interpreted many different ways. Therefore, it is important that everyone knows what exactly is required. He is also advised to ask for reasoning behind any requirements that seem arbitrary or hinder progress because it may be something that is outdated or that could be compromised. The last words of wisdom he had were to clarify what is needed at the end of conversations and to hold people responsible for their portion of the project.

Being a part of a group of nine students designing and creating a sounding rocket has given me the smallest taste of what NASA projects encompass. Within even our small group, any lack of communication causes a ripple throughout the project. In addition, when leadership has trouble foreseeing events, ascertaining and explaining requirements, or even pushing team members a littler further than they had planned, the group as a whole struggles a little bit more.

Although the panel could not be specific as to how to create perfect communication or a pick the optimal leader, they did give general advice to in the success of every project. The seasoned panelists have seen their fair share of failures and triumphs. The guidelines they explained should be the internal structure that every project is molded around.

NASA Dilemma: How to Diversify the Workforce

Panel Next Generation of Project Managers
Written by Reginald Phillips
Bethune-Cookman University

NASA is facing difficult challenges that they may have not faced since the inception of the space program. The challenge that NASA currently faces is how to gain the interest of today's youth, identifying what it will take to bridge the gap between young NASA employees and those retiring in the near future, and determining new methods of recruiting that will help to increase the diversity between old and new employees. This conference was to present NASA's new direction in building their workforce.

The agency has found that young children no longer dream of traveling to space or other careers within NASA and have sought to make adjustments in their recruiting methods. Laura Campbell identified ways that NASA is trying to interest children in their agency. She spoke of NASA's space camp; the agency feels that space camp and its programs can build enthusiasm for space jobs and develop a higher interest level for children in the space program.

What will it take to bridge the gap between new and old NASA employees? Ray Lugo reported that although new employees are helped by the older employees, there is a challenge to come up with new ideas in order to inspire friendly competition and creativity among them. He also noted that there is reluctance from the hiring manager to hire younger, entry-level employees who they lack experience, therefore they hire older persons to fill vacant positions.

Charles Hunt feels that creating new positions will allow the agency to seek talented potential employees; he also stated that NASA must look outside of their normal recruitment areas and seek qualified applicants. In the past, the search took place in areas closest to NASA's facilities or within families of current employees. Ken Dolan agrees and stresses that NASA needs to offer strong internships and co-ops, intensive recruitment at campus career fairs, and other job fairs should occur. He feels that the agency should get campus advisors involved in the process of recruitment, as well as requiring outside contractors to contractually agree to hire a certain amount of interns for positions that they have been awarded.

NASA needs to make an investment in their workforce declared Stephen Jeffress, claiming that the agency currently hires individuals who are in their thirties. Jeffress declared that they must begin to hire students out of college so that they can change the dynamics of their workforce. Seeking talented and skilled employees at a younger age will bridge the current workforce and allow NASA to continue to maintain a diverse workforce.

Iterative Risk Driven Design Approach for CEV Avionics

Speaker Michael Bay
Written by Kevin Mock
Embry-Riddle Aeronautical University

As NASA designs, builds and tests the new spacecraft of the Constellation program, risk driven design approaches must be used to ensure safety of the crew and the reliability of the complex systems required for manned spaceflight. In the discussion of the Crew Exploration Vehicle (CEV) Avionics system design, Michael Bay, a chief engineer for Bay Engineering Innovations, showed the importance of using risk analysis to evaluate design alternatives. The approach to solving such a complex problem included the idea of the "building up" of the system from the simplest design to a point where the system is considered safe for human spaceflight. This build up approach assures resources are applied where they do the most good and controls complexity.

In this approach Bay started with the outlining of design requirements. He was very keen to point out that their goal was to only layout the minimum design from a functionality aspect. "Too many upfront design requirements prevent exploring of other designs," said Bay and stressed that "upfront design requires flexibility creativity that can be over constrained by too many requirements." From these minimalist design, a first iteration system was designed and mass estimates for the system were determined. The goal of the first iteration was to make the system as simple as possible and yet as safe as possible. This design was evaluated from a risk perspective to check for potential functional and safety related failures. Components and redundancies were then added or removed from the system on the basis of importance to safety and mission success and their mass penalties. It is of course the priority of these systems to bring the crew home safely, but they must also be simple, lightweight, and reliable.

During this iterative process, thorough risk analysis was conducted on each design. All possible known risks were studied and given a priority level of Safety Critical, Mission Critical, or Non critical. A majority of the time, safety and reliability can be solved by redundancy, however Bay advised against strictly using this approach. He instructed that diverse parallel systems should be used to ensure safety, citing that redundant systems can fail in exactly the same way. This is not normally the first thing that comes to mind when designing a system, as different parallel systems typically add complexity that is generally unwanted. However, when safety is the main priority such complexities must be tolerated. Additionally, Bay noted that redundancies and parallels should not be the only backup to primary systems. A safe mode system that provides the very basic functions for safety should be provided as well. Safe modes "are good protection against common cause failures," Bay said.

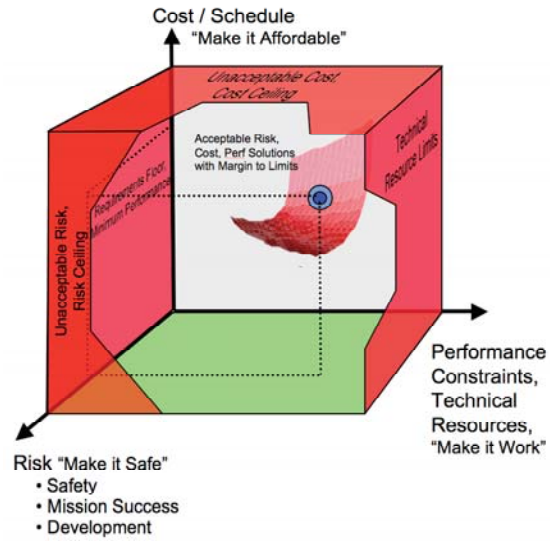


Figure 1 : Effectiveness Box

Since designing a human space vehicle that will carry men to the moon and beyond is such a complex, challenging, and expensive process, much more then just safety must be addressed. Three important criteria play heavily on the successful implementation of spacecraft design. Figure 1, shows a perspective where often competing needs must be considered to keep the ultimate solution "In the Box". The goal of this approach is to place constraints on each of the three considerations to create an effectiveness box. A system is then designed to stay in the box in all three aspects of risk, cost, and performance. Appling the build up approach starts with cost and performance constraints in the box, but risk out side the box. As the system is built up, risk is reduced with attendant increases in cost and technical resources. Bay also stressed how important it was to provide a safety margin in all three aspects of design so that not one area approaches the constraints as the design matures.

Through this approach of build up iterations and risk analysis, NASA hopes to design a safe and efficient avionics system for the Crew Exploration Vehicle. The hopes are that this will eliminate any over complex systems that may jeopardize the safety of the crew or the success of the mission as we explore the moon and beyond.

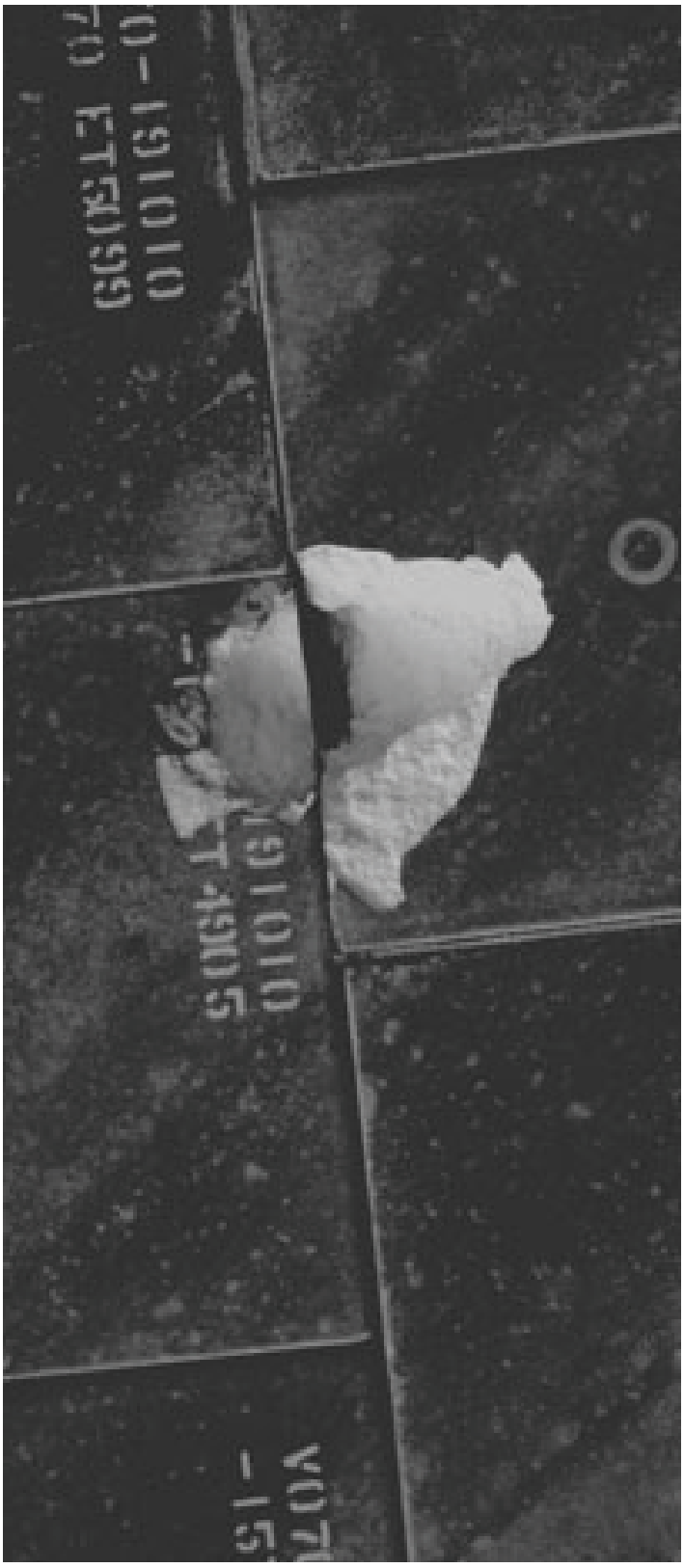
Learning from Past Experiences

Speaker Michael Hulet
Written by Danielle Morris
Bethune-Cookman University

Many of us have made mistakes, whether under or beyond our control, that we eventually learned from and corrected. Unfortunately, sometimes mistakes and mishaps repeat themselves creating what seems to be an endless and messy cycle. In the presentation, "Learning from Past Experiences," the speaker, Michael Hulet, reveals the reason for recurring mistakes and the techniques NASA uses to prevent them.

As an introduction, the speaker reveals the reason for recurring mistakes: a lack of communication. To prevent mistakes from recurring, it is essential to incorporate good communication between NASA divisions. The most common technique consists of periodic emails and reports sent to employees for education purposes. These reports consist of a detailed description of the incident and its solution if an investigation was performed. Another technique widely used is the close call database in which employees report close call incidents. These reports are reviewed, addressed, and corrected through investigation and are posted for employees as a resource. Several safety sites are also available to educate and inform employees of mishaps, potential hazards, inspections, and safety alerts which contain information similar to the emailed reports.

In conclusion, whether an incident results in success or failure, communication is a vital key in breaking mistake cycles and ensuring safe and successful projects.



Project Management 101: “What is Project Management?”

Speaker Jim Cassidy
Written by Andrew Leech
Embry-Riddle Aeronautical University

As a graduating senior from Embry-Riddle Aeronautical University, the last lecture that I thought I would be interested in at this year’s Project Management Challenge would be “Project Management 101: What is Project Management”. Yet, as I found myself listening to Jim Cassidy explain the basics of Project Management, I became very interested. He dove right in by explaining some major terms, including the Project Management Institute, Project Management Professional – PMP, and the PMBOK (Project Management Body of Knowledge). Following this, Mr. Cassidy explained that in order to be a Project Manager, one must know that a project is defined as “a temporary endeavor to create a unique product or service.” He explained that a project has a finite end while the program that it is in will continue on. Mr. Cassidy went on saying that projects come and go, but you have to be able to roll with whatever is thrown at you.

One of the most important points that I was able to take away from the lecture was the open discussion that ensued when talking about leading people on your team. Knowing your management style increases your ability to relate to your team. There are three management styles to choose to implement in your office: Autocratic, Participatory, and Laissez-faire. But, knowing your management style is only the first step. Having the ability to adapt your style to the project at hand is what separates a good Project Manager from a great one. You may have people on your team who are very independent and do not need a manager to look over them at all times, while have other people who are the opposite and need more attention. This places you in a situation where you need to best estimate what type of management style best fits your project and your people.

Another great tip that I attained from Mr. Cassidy was to always sit down after a project and write-up a “Lessons Learned” report. This will not only help you as a Project Manager to learn from your mistakes but for others who may try to pick up the project later down the road.

On a final note, I would like to thank the people at NASA for allowing me to participate in this year’s Project Management Challenge and Mr. Jim Cassidy for teaching a student, who is used to taking Aerospace Engineering 400-level courses, a little thing or two in “Project Management 101: What is Project Management.”

Bridging the Research and Spaceflight Operations Gap

Speaker Michael J. Gazarik
Written by Jarel Lawrence
Bethune-Cookman University

The NASA Project Management Challenge gave me the opportunity to meet engineers that work in different branches of NASA, network with program and project managers that work on different missions for NASA, and to attend sessions where employees of NASA and other companies served as speakers and addressed different issues about project management.

The session I found most interesting was titled “Bridging the Research and Spaceflight Operations Gap: The EVA IR Camera Experience” by Dr. Michael J. Gazarik. This presentation explored the performance of a multi-centered team that was highly motivated to design, develop, and deliver a critical spaceflight inspection tool for the astronaut corps. The presentation also included lessons-learned on how to bridge the gap between NASA’s research centers and NASA’s spaceflight operation centers.

The presentation given by Dr. Gazarik showed how teams come together to solve a problem and enjoy working together. Dr. Gazarik is the Branch Chief of the Remote Sensing Flight Systems Branch (RSFSB) at the NASA Langley Research Center (LaRC) in Hampton, Virginia. He is also the Principal Investigator and Development Manager for the Space Shuttle Extravehicular (EVA) Infrared (IR) Camera Project, also known as the EVA IR.

The EVA IR Camera is the only system available to the Shuttle’s flight crew that can detect subsurface damage in the Orbiter’s wing-leading edge. Dr. Gazarik also serves as the Program Manager and lead Systems Engineer for the National Polar-orbiting Operational Environmental Satellite System (NPOESS) and the Airborne Sounder Testbed-Interferometer (NAST-I).

It was a treat and great experience to attend the Project Management Challenge and see the different developments that NASA has in store for years to come. It was great to hear speaker’s personal thoughts and feelings on events at NASA. It is an experience that I feel that any engineering student should experience.

The Constellation Program Team

Speaker Christian Hardcastle
Written by Jennifer MacRae
Embry-Riddle Aeronautical University

At NASA PM Challenge 2008, Christian Hardcastle presented "The Constellation Program Team: Reaching Higher and Further." Mr. Hardcastle is the director of Systems Engineering and Integration Office at NASA's Johnson Space Center. This presentation focused on transitioning the team from a focus on requirement definition to a focus on executing a design.

Leveraging the capabilities and knowledge of a diverse Constellation Program team from throughout NASA and industry involves an extraordinary commitment to teamwork," explained Hardcastle. The Constellation Program has a gallant vision for Space Exploration, which includes the completion of the ISS, develop and fly the Crew Exploration Vehicle (Orion) no later then 2014, return to the moon no later than 2020, extend human presence across the solar system and beyond, and promote international and commercial participation in exploration, to name a few. In order to make these visions a reality the Constellation Program has also developed exploration strategy themes. Some of these themes include: to use the moon to prepare for future human and robotic missions to Mars and other destinations, to pursue scientific activities to address fundamental questions about the solar system, the universe, and our place in them, to strengthen existing and create new global partnership, and above all, to engage, inspire, and educate the public.

In order to transition from requirements foundation to Preliminary Design and DDT&E HW/SW, there needs to be continued growth of a high performance, virtually distributed, nationwide team that will strive to recognize people as our key resource, focus on results and never lose sight of the customers'/stakeholders' needs, and leverage the best of the NASA, other Government Agencies and Industry. The team will also have to foster open and honest communication, develop integrated and prioritized plans while being flexible and adaptive, build off of world-class technical requirements and the defined verification methods/means, and encourage proper checks and balances by embracing the governance model and independent assessments. "The Constellation Program has demonstrated proven results in its aggressive formulation as a DDT&E Large-scale Program," said Hardcastle.

The team has seven fundamental enablers to facilitate a successful transition between the foundation and preliminary design phases. These enablers are:

- Combat "Requirements Creep" and aggressively control/monitor technical cost and schedule baselines.
- Measure design compliance, innovation, integration and drive timely bounding and mitigation of emerging technical risks.
- Focus on "The Mission" and the design of all aspects of preparing for and executing the mission.
- Refine time phase compatibility strategy, structure and build up details.
- Plan and integrate detailed hardware and software incremental development, integration, qualification, verification and validation at all levels
- Enhance interface control documents and integrated hazards
- Preserve architecture key driving requirements and focus on survivability, reliability, maintainability, interoperability, interchangeability, supportability, and extensibility to enhance safety and long-term operability/affordability.

The enablers are contingent on the four main program tenets; which are crew safety, mission success, program risk mitigation, and life cycle costs. If these four key views are followed and implemented, program success can be achieved, as proven by many successful projects such as the Apollo and Saturn programs. Accordingly, critical errors can be avoided by learning valuable lessons from the past.

PM Challenge 2008: Regaining Momentum

Speaker Reflection
Written by Enzo Cristobal Ramirez
Embry-Riddle Aeronautical University

On February 26th and 27th, I had the opportunity to attend the annual Project Management Challenge 2008 conference hosted by NASA at the Hilton Oceanfront Hotel in Daytona Beach, FL. As an undergraduate senior from Embry-Riddle Aeronautical University (ERAU), pursuing to be an Aerospace Engineer, this became one of my favorite events that I have attended during my college years. The main reason why I enjoyed it so much was because of the outstanding speakers and their interesting topics, the friendliness of the individuals representing their companies in their respective booths, and the wonderful environment after the presentation hours to socialize.

As I arrived on the morning of the 26th and began to meet with a few friends from ERAU, we naturally walked through the 30+ booths to orient ourselves. It caught my attention how the majority of the personnel at the booths asked us questions and tried to get to know us better. I clearly remember spending over 20 minutes talking to a man from the Wallops Flight Facility in Virginia, where Embry-Riddle Future Space Explorer and Developer Society (ERFSEDS) launched its first sounding rocket, about the many opportunities that college students in our field of study have. What really impressed me was their willingness to help us, not by simply exchanging business cards, but by directly taking our names and information for future co-op or inter opportunities. This became an assurance that the many years of hard work at college are finally paying-off and the fact that I am still heading in the right direction to pursue my career goals.

As the morning continued, it was time to head towards our selected speaker's presentation. As we walked through the crowd, I began to realize that we were the youngest, but that everyone treated us, and each other, with the utmost respect. It was almost like the feeling that is present in a tense situation, with the difference that the room was full of professionalism. Our speaker was Christian L. Hardcastle, Director, Systems Engineering and Integration Office from NASA at Johnson Space Center. His presentation was based on the Constellation program and their respective goals for the future. I really enjoyed Mr. Hardcastele's presentation because it was very well prepared, with plenty of visual aids and short computer generated videos of Ares I and Ares V rockets launches. It was also interesting to note that this presentation was well suited for both managers and engineers since Mr. Hardcastle was able to incorporate both views effectively. Even after the presentation, as we were asking him questions, Mr. Hardcastle was very helpful and extremely knowledgeable. One of my favorite events during the entire two-day conference was the "dinner," where everyone had the chance to enjoy great conversation while relaxing at the same time.

I do not wish to focus on the fact that there was a lot of "free-food" in the eyes of a broke college student, but rather focus on the people that I was able to meet. Most of the conversations at this point were elaborate and personal. This is mainly because I was able to explain why I attended college in the USA and not back home in South America, Chile, and what were my plans for the future. Amongst them, I had the privilege to talk to Dr. Toshifumi Mukai, a Senior Chief Engineer for Japan Aerospace Exploration Agency (JAXA). This opportunity arose out of the blue as I was searching for chocolate covered strawberries, and while doing so I recognized Dr. Mukai from a distance. I have been investigating JAXA for a period of time and to meet Dr. Mukai was just amazing. Having lived in Japan for eight years, and knowing Japanese, I tried to speak the best Japanese possible, even though I hadn't spoken it in a while.

Yet, as we talked and got to know each other, my insecurities about speaking Japanese slowly began to fade away and it wasn't so hard to communicate anymore. Dr. Mukai's patience definitely showed his desire to help me as I asked the many questions that I couldn't find answers to through online research.

The PM Challenge conference was definitely helpful to me as I managed to meet people, ask questions, and establish contacts that otherwise I wouldn't have had the opportunity to do. It is through these types of conferences that college students, like me, are able to learn many valuable and key lessons that are not always taught in classrooms. I believe that many students start off their college experience with a high optimistic momentum. This momentum is lost through the many years of hard work and students begin to inevitably lose sight of their career goals. Sometimes simply meeting and talking to a professional in one's field of study will bring back that ambition and help one regain that momentum. In my case, the PM Challenge conference did exactly that.

PM CHALLENGE 2009

We hope that you have enjoyed PM Perspectives 2008.

Be sure to check the conference website at: http://pmchallenge.gsfc.nasa.gov for further information about PM Challenge 2009.

CONNECT AND DISCOVER

NASA Project Management Challenge 2009

February 24-25, 2009
Hilton Oceanfront Hotel, Daytona Beach, Florida
Near Kennedy Space Center

APPEL